Claims

1. An apparatus comprising:

a power source providing current pulses with high frequency harmonics to a heater coil, the coil generating a magnetic flux for inductive heating of an article.

2. An apparatus according to claim 1,

wherein the high frequency harmonics enhance a relative proportion of inductive heating compared to resistive heating of the heater coil.

3. An apparatus according to claim 1,

wherein the current pulses produce an increased amount of inductive heating compared to a resonance sinusoidal signal.

4. An apparatus according to claim 1,

wherein the current pulses produce an increased amount of inductive heating compared to a sinusoidal current of a same magnitude and same fundamental frequency.

5. An apparatus according to claim 1,

wherein the current pulses have an associated energy component above a border frequency of the heater coil.

6. An apparatus according to claim 1,

wherein the current pulses increase an inductive portion of heating in the article without increasing the Root Mean Square (RMS) current in the heater coil.

7. An apparatus according to claim 1,

wherein the power source includes a low or line frequency current source.

8. An apparatus according to claim 1,

wherein the heater coil includes a resistive conductor for generating resistive heat.

9. An apparatus according to claim 8,

wherein the resistive conductor is in thermal communication with the article.

10. An apparatus according to claim 1,

wherein the heater coil is inductively coupled to a load which includes the article.

11. An apparatus according to claim 10,

wherein the magnetic flux induces eddy currents in the load.

12. An apparatus according to claim 10,

wherein the load includes a closed loop for the magnetic flux.

13. An apparatus according to claim 12,

wherein the load includes a ferromagnetic core and ferromagnetic yoke which form the closed loop.

14. An apparatus according to claim 10,

wherein the load includes a core and the heater coil is at least partially embedded in the core.

15. An apparatus according to claim 10,

wherein the load includes a core and a yoke and the heater coil is disposed between or embedded within at least one of the core and yoke.

16. An apparatus according to claim 15,

wherein the core and yoke form a closed loop for the magnetic flux.

17. An apparatus according to claim 15,

wherein the core and yoke are ferromagnetic.

18. An apparatus according to claim 10,

wherein the load includes a core having a passageway for a flowable material.

19. An apparatus according to claim 18,

wherein the core heats the flowable material.

20. An apparatus according to claim 1,

wherein the heater coil is positioned in the core so that heating is concentrated in the passageway.

21. An apparatus according to claim 1,

wherein the article forms at least part of a closed loop for the magnetic flux, the article having a first portion in which inductive heating is more concentrated compared to a second portion of the article.

22. An apparatus according to claim 21,

wherein the second portion creates discontinuities or restrictions to the flow of eddy currents.

23. An apparatus according to claim 22,

wherein the second portion has slots creating the discontinuities or restrictions.

24. An apparatus comprising:

a variable power source for providing current pulses with an adjustable energy content to a heater coil so as to adjust a ratio between inductive and resistive heating produced by the coil.

25. An apparatus comprising:

a heater coil inductively coupled to an article;

the article having a passageway for a flowable material to be heated;

the coil being positioned in the article to deliver heat generated inductively in the article to the flowable material in the passageway; and

a source of adjustable nonsinusoidal current pulses coupled to the heater coil for adjusting the delivery of inductive heating to the flowable material in the passageway.

26. A method comprising:

providing a heater coil in thermal communication with and inductively coupled to an article; and

providing an adjustable nonsinusoidal current pulse signal to the heater coil for adjusting the ratio between inductive and resistive heating of the article.

27. A method comprising:

providing a heater coil inductively coupled to an article; and

providing a nonsinusoidal current pulse signal to the heater coil with the pulse having a rate of change which produces high frequency harmonics.

28. An apparatus comprising:

an article to be inductively heated;

a heater coil generating a magnetic flux and inductively coupled to the article;

the article forming at least a portion of a closed loop for the magnetic flux;

the heater coil being at least partially embedded in the article; and

a current pulse signal with high frequency harmonics supplied to the heater coil.